Supplemental Electronic Material

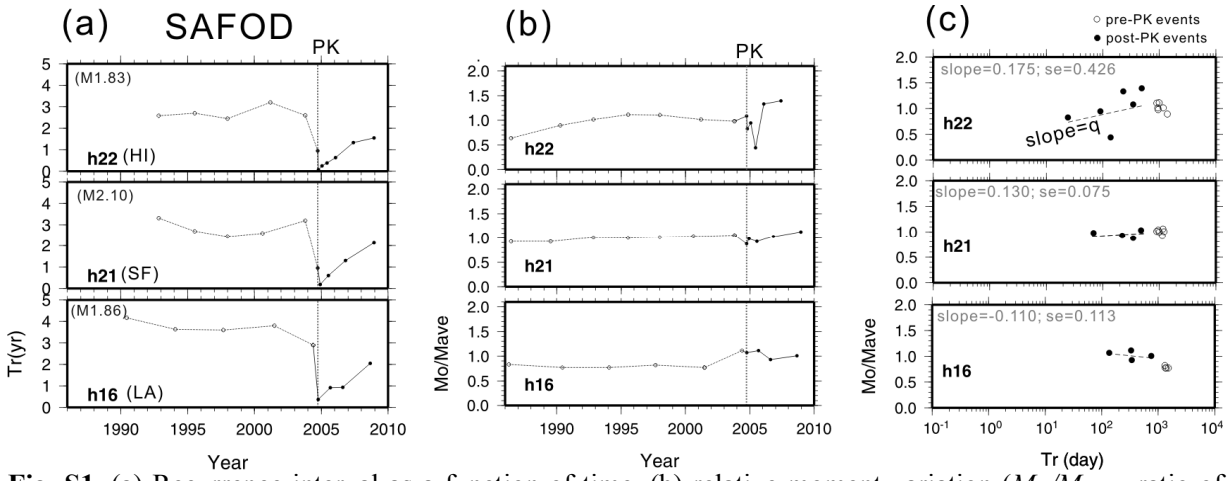

Fig. S1. (a) Recurrence interval as a function of time, (b) relative moment variation (*Mo/Mave*, ratio of *Mo* and average *Mo* of the sequence, Mo/Mave) as a function of time, and (c) relative moment as a function of recurrence interval for SAFOD repeating sequences. By least squares method we fit the postseismic data using Mo/Mave ~ q logTr, as shown by the slope (dashed line) with standard error (se). Recurrence and seismic moment data before 2001 August are from Northern California Seismic Network, as denoted by dashed line in (a) and (b). Black and open circles indicate post- and pre- Parkfield events, respectively. Vertical dashed line and PK represent the time of the 2004 *M*6 Parkfield event.

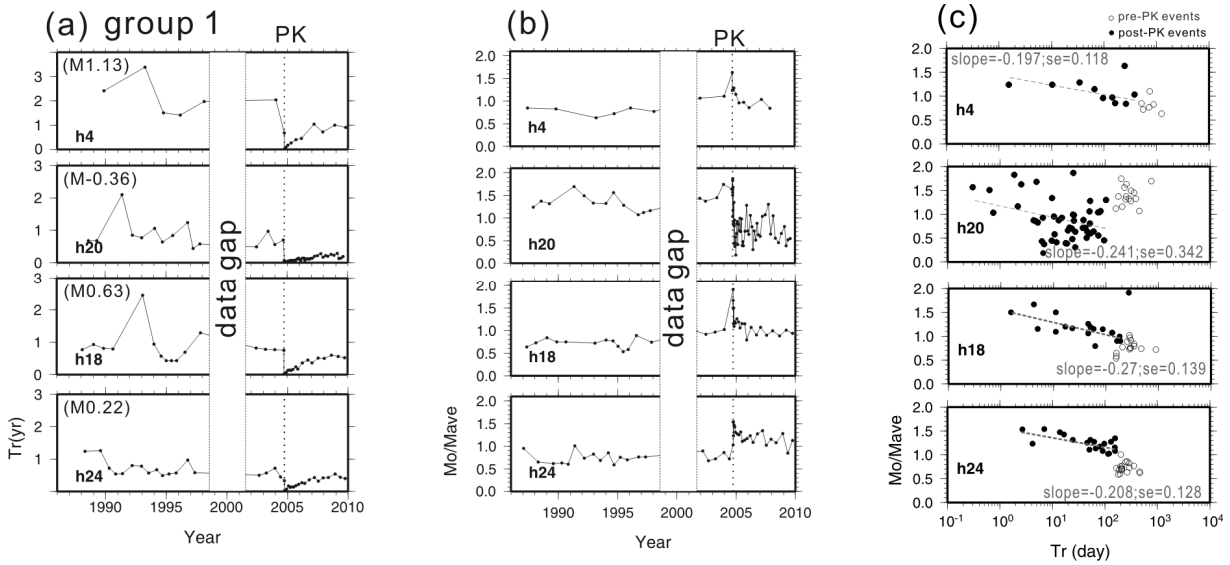

Fig. S2. (a) Recurrence interval as a function of time, (b) relative moment variation (*Mo/Mave*, ratio of *Mo* and average *Mo* of the sequence) as a function of time, and (c) relative moment as a function of recurrence interval for group 1 repeating sequences. Black and open circles indicate post- and pre-Parkfield events, respectively. By least squares method we fit the postseismic data using *Mo/Mave* ~ q log*Tr*, as shown by the slope (dashed line in (c)) with standard error (se).

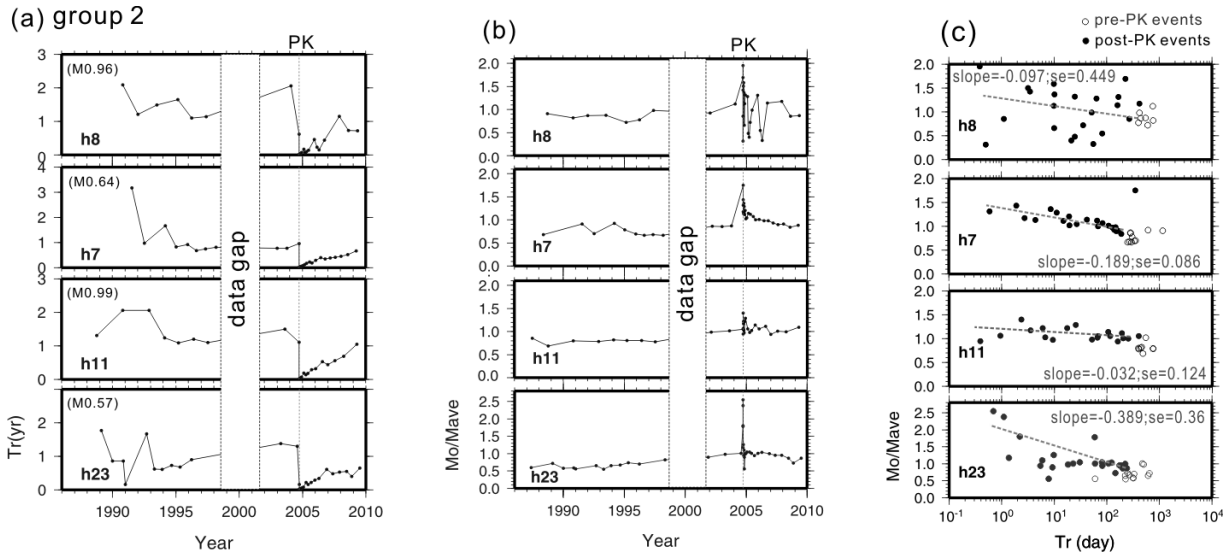

Fig. S3. (a) Recurrence interval as a function of time, (b) relative moment variation (*Mo/Mave*, ratio of *Mo* and average *Mo* of the sequence) as a function of time, and (c) relative moment as a function of recurrence interval for group 2 repeating sequences. Black and open circles indicate post- and pre-Parkfield events, respectively. By least squares method we fit the postseismic data using $Mo/Mave \sim q \log Tr$, as shown by the slope (dashed line in (c)) with standard error (se).

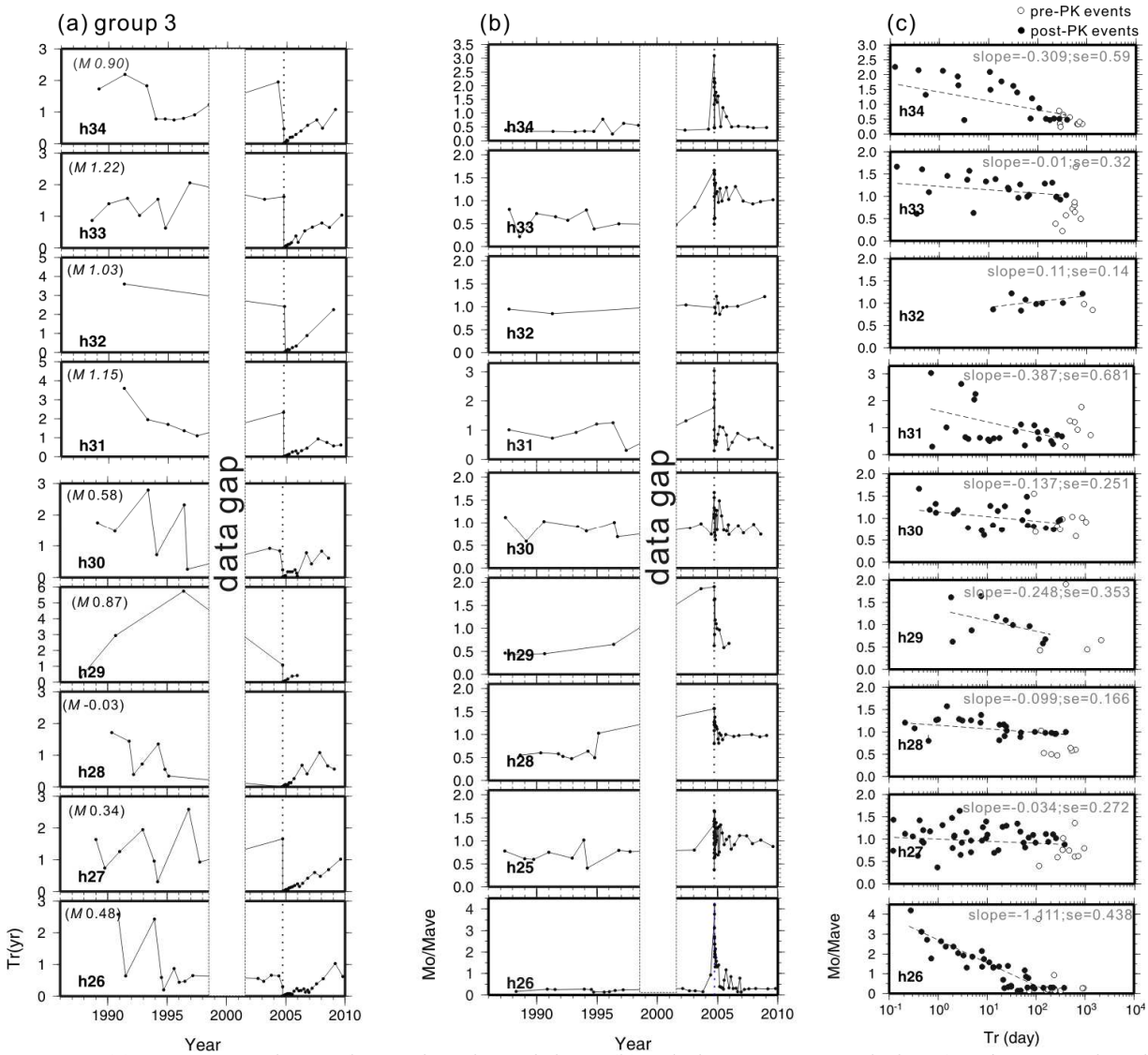

Fig. S4. (a) Recurrence interval as a function of time, (b) relative moment variation (*Mo/Mave*, ratio of *Mo* and average *Mo* of the sequence) as a function of time, and (c) relative moment as a function of recurrence interval for group 3 repeating sequences. Black and open circles indicate post- and pre-Parkfield events, respectively. By least squares method we fit the postseismic data using *Mo/Mave* ~ q log*Tr*, as shown by the slope (dashed line in (c)) with standard error (se).

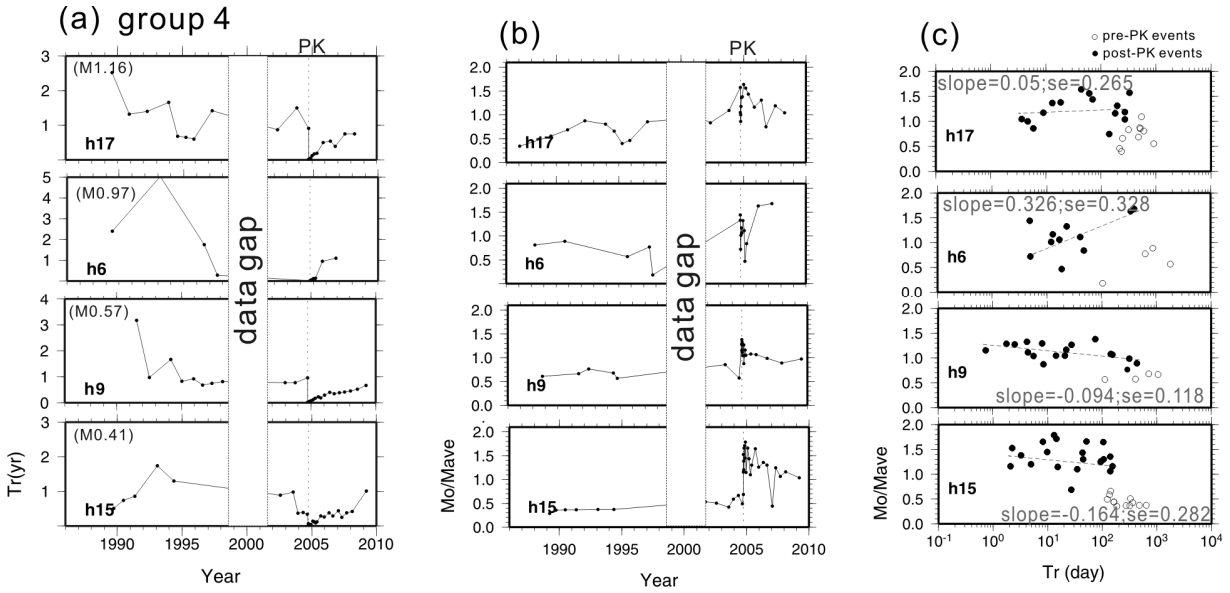

Fig. S5. (a) Recurrence interval as a function of time, (b) relative moment variation (*Mo/Mave*, ratio of *Mo* and average *Mo* of the sequence) as a function of time, and (c) relative moment as a function of recurrence interval for group 4 repeating sequences. Black and open circles indicate post- and pre-Parkfield events, respectively. By least squares method we fit the postseismic data using $Mo/Mave \sim q \log Tr$, as shown by the slope (dashed line in (c)) with standard error (se).

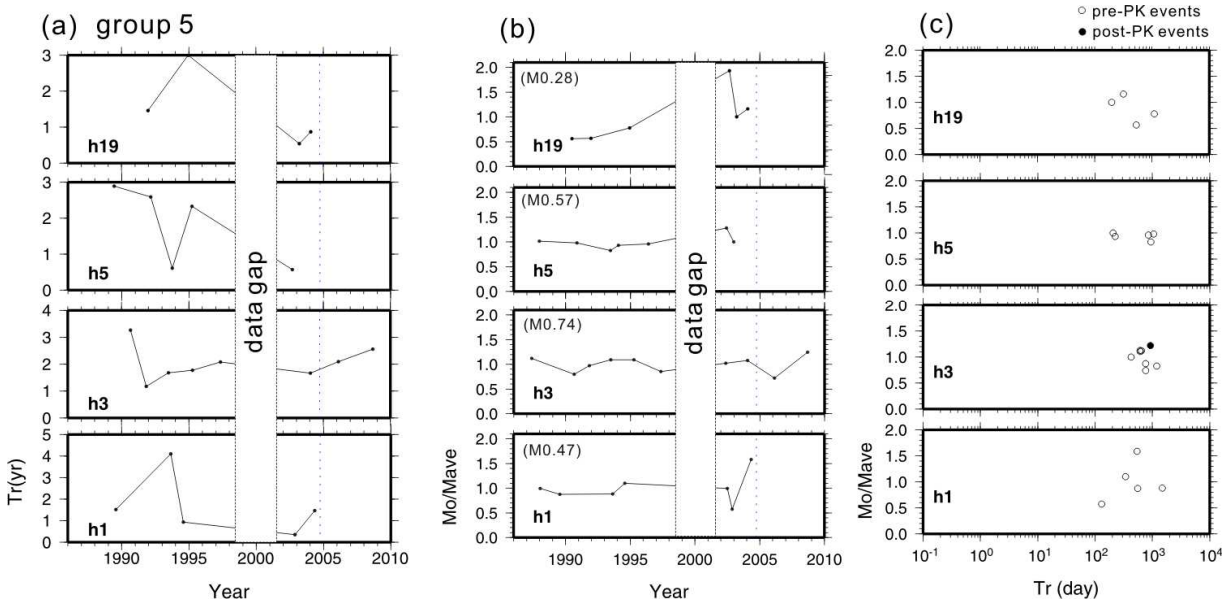

Fig. S6. (a) Recurrence interval as a function of time, (b) relative moment variation (*Mo/Mave*, ratio of *Mo* and average *Mo* of the sequence) as a function of time, and (c) relative moment as a function of recurrence interval for group 5 repeating sequences. Black and open circles indicate post- and pre-Parkfield events, respectively.

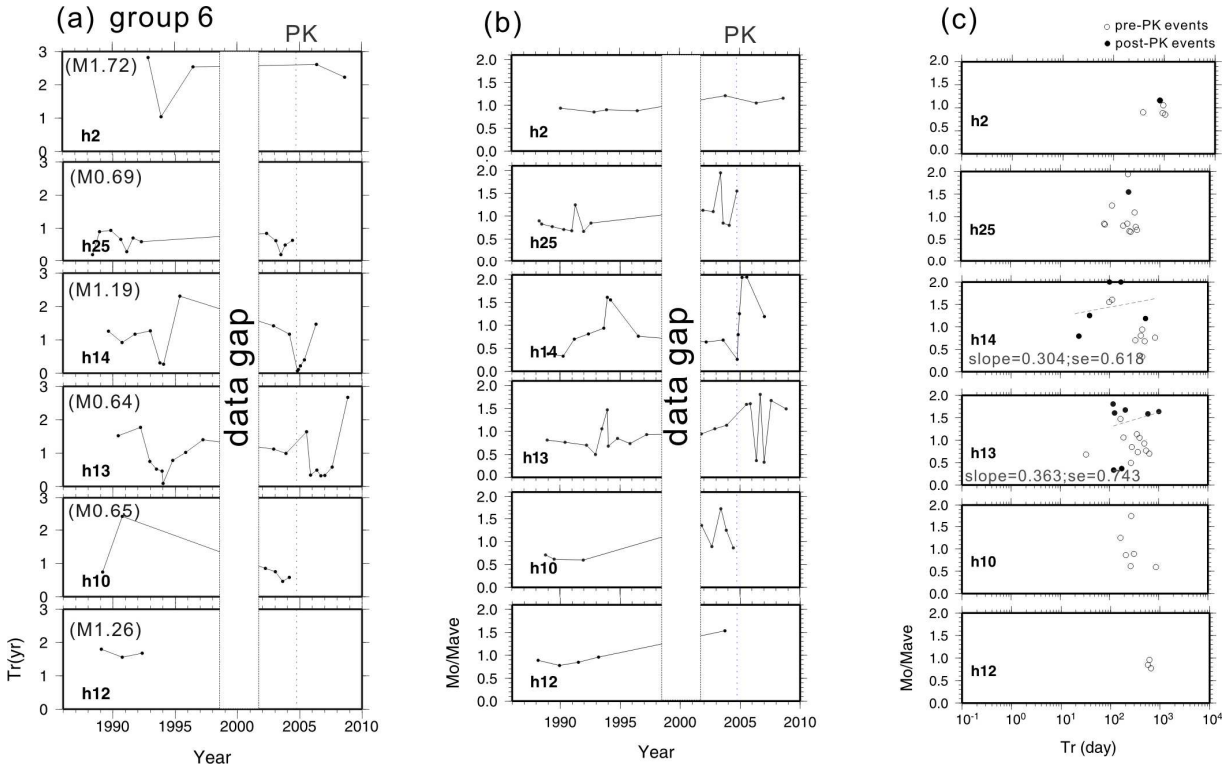

Fig. S7. (a) Recurrence interval as a function of time, (b) relative moment variation (*Mo/Mave*, ratio of *Mo* and average *Mo* of the sequence) as a function of time, and (c) relative moment as a function of recurrence interval for group 6 repeating sequences. Black and open circles indicate post- and pre-Parkfield events, respectively. By least squares method we fit the postseismic data using *Mo/Mave* ~ q log*Tr*, as shown by the slope (dashed line) with standard error (se).

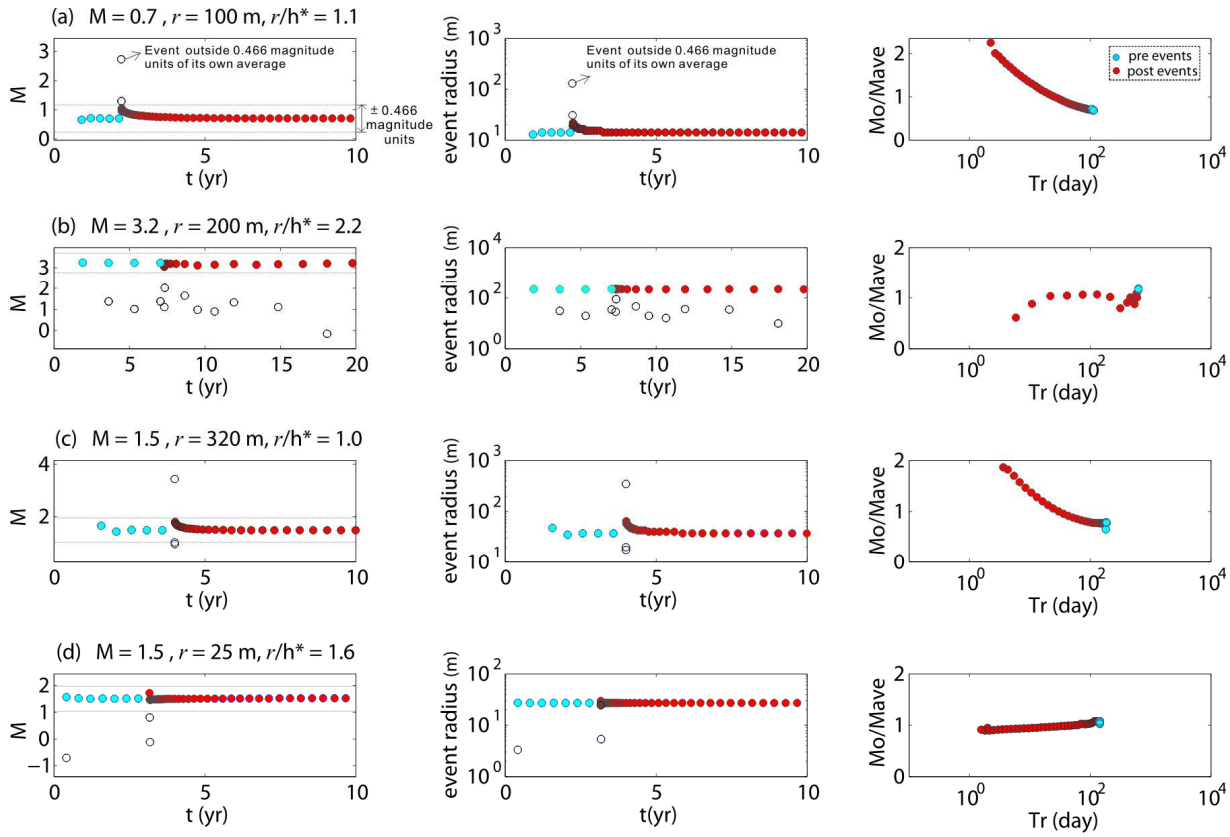

Fig. S8. Simulation results for RES response to postseismic effects of a large nearby event using different model parameters. **Left panel**: Event moment versus time. Events with moments that differ by less than 0.466 (gray dash lines) in magnitude from the average unperturbed events are plotted in Fig 5 for comparison with observations. Blue and red circles indicate the preseismic and postseismic events, respectively. Much larger or smaller events are denoted by open circles; their magnitudes are sufficiently different from pre-perturbation events that they might not be identified as events from the same repeating sequence. Dashed lines correspond to the maximum magnitude range revealed from repeating earthquakes observation. **Middle panel**: Event radii for the cases of the left column. For simulations with ratios r/h^* comparable to 1 (rows a and c), event radii increase after the sudden change in shear stress; for simulations with larger ratios r/h^*, event radii stay about the same (rows b, d). **Right panel**: Relative event moment versus recurrence interval *Tr,* as shown in Fig. 5b-5e, repeated here for comparison with other panels. In this panel, the events with large variation in magnitude are excluded.

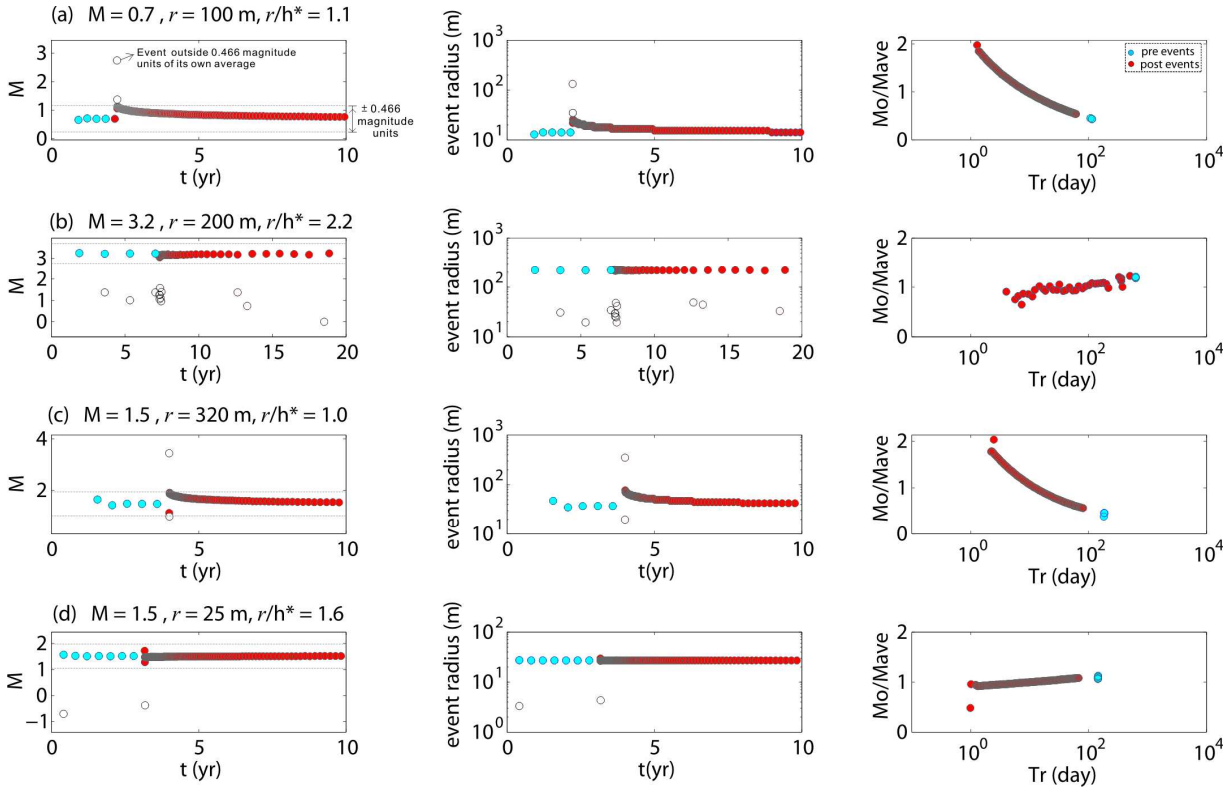

Fig. S9. The same results as in Fig. S8, but with t_r = 10 yr (equation (1)) instead of t_r = 2 yr. The model behavior with the two values of t_r is qualitatively the same.